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PROGRAM LIBRARY

DECUS NO.	8-245
TITLE	DYNAMICS OCTAL DISK DEBUGGER
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DATE	July 25, 1969
SOURCE LANGUAGE	PAL-D

2020

January 1, 2020



Dear Sirs,

I have the honor to acknowledge the receipt of your letter of the 15th inst.

in relation to the above mentioned matter.

I am sorry to hear that you are not satisfied with the result.

I will be glad to discuss the matter further if you wish.

Very truly yours,

[Signature]

[Name]

[Address]

[City, State, Zip]

DYNAMIC OCTAL DISK DEBUGGER

DECUS Program Library Write-up

DECUS No. 8-245

INTRODUCTION

DODD is a complete debugging and general service program for those users with a DF32 Disk and a LAB-8 Computer. Inspection and alteration at any level from single word to complete disk-dump operations are possible. DODD has its own disk input/output routine allowing it to be used at any time without other software support, excepting loaders. All output from the computer is via the LAB-8 oscilloscope screen and input is through the ASR-33 keyboard without teletype echo ensuring the fastest possible reaction between the computer and user. The teletype is used to output permanent directory lists and block lists. As implied in the name DODD all interaction is in octal arithmetic as this is the basic format of the disk system. Provision is made in the program for the utilization of option XR (variable brightness) if it is present.

LOADING

DODD may be loaded with the binary loader and started at location 5200. If a system loader is present DODD may be loaded in one pass. If desired DODD may be saved on a disk or tape:

SAVE DODD! 4600-6777;5200

OPERATION

DODD operation is characterised by three possible operating modes. These are: ENTRY MODE, EDIT MODE or ERROR MODE. When the program is started, or restarted at any time, at location 5200 it starts in ENTRY MODE. In this mode the oscilloscope screen displays the message:

"TYPE BLOCK NUMBER"

To begin inspecting or editing a disk block the block number is typed in followed by a carriage-return. The basic input interpreter which is functional during ENTRY MODE and EDIT MODE can accept the following inputs:

- 1) Octal numbers up to 7777, preceding zeros are not required.
- 2) RUBOUT, erases all previous numerical entries.
- 3) CONTROL-C, immediate return to Disk-Monitor System (if present).

- 4) CONTROL-P, return to ENTRY MODE.
- 5) CARRIAGE-RETURN, terminates a numerical input.
- 6) ASTERISK, same function as CARRIAGE-RETURN.
- 7) L, (see section on DIRECTORY LISTING).

When the number of the block required has been entered followed by a carriage-return or asterisk the program will enter EDIT MODE.

For the purposes of display the block of 128_{10} words is broken up into 16_{10} lines of 8 words. During EDIT MODE one of the lines will be displayed on the screen at any one time together with an identifying line number ($0-17_8$); also displayed will be an arrow pointing upward at the word which is currently available for alteration by keyboard input. To alter a word the new value is typed in followed by a carriage-return or asterisk as before. This operation automatically moves the arrow along to the next word and at the end of a line resets the arrow and calls the next line. Other inputs which the interpreter will handle, as well as those described previously, are as follows:

- 8) SPACE BAR, moves the arrow along one word without changing the word.
- 9) BACK-ARROW, moves the arrow back one word as far as the first word.
- 10) GREATER-THAN, changes the display to the next line.
- 11) LESS-THAN, changes the display to the previous line.
- 12) ALT MODE, returns the display to line 0, word 0.
- 13) P, (see PRINT).

All editing operations are carried out on a core buffer of the disk block which was requested; the disk is not altered in any way until the editing operation is terminated with one of the following inputs:

- 14) CONTROL-D, the disk buffer is written onto the disk and the disk monitor system is entered (if present).
- 15) CONTROL-N, the disk buffer is written onto the disk and the program returns to ENTRY MODE.
- 16) CONTROL-F, the disk buffer is written onto the disk and the next block in the file is placed in the disk buffer, the program enters EDIT MODE. If the current block is the last block in the file the program returns to ENTRY MODE.

ERRORS

If the input interpreter receives more than four octal number inputs it will assume that an error has been made, in this case the input buffer is cleared and a bell is sounded to inform the operator that the error has occurred. Most other errors, such as meaningless input, are ignored by the interpreter but two errors of a more serious nature cause the program to enter ERROR MODE. In this mode the error message is displayed on the screen. The two possibilities are:

a) The disk input/output routine has failed. The screen displays:

"DISC ERROR"

Reasons for this error include having the protect switches on when writing on the disk. Exit from the ERROR MODE in this case depends on the fault but ALT MODE will return the program to EDIT MODE if the error occurred while writing on disk.

b) An attempt has been made to read in a BLOCK CHANGE TAPE (see PRINT) while the program was in ENTRY MODE. The screen displays:

"INPUT FAULT?"

This error may be corrected by using CONTROL-P.

DIRECTORY LISTING

At any time during the operation of the program a listing of the disk directory contents may be obtained by striking L. The list which is made contains three columns, the file name, the DN ENTRY WORD (see B-4 Disk Monitor System Manual) and the number of the first SAM BLOCK of the file. An example list is shown in the APPENDIX.

Note that in the case of a file which has an entry in the directory but which has not been allocated any SAM BLOCK entries the listing routine types a ? in the starting SAM BLOCK column. The listing is invaluable for disk debugging with DODD since it gives the location on disk of all the files.

PRINT

When the program is in EDIT MODE a printout of the current block may be made by striking P. The printout is broken up into 16_{10} lines in the same way as the display. If the tape punch is switched on before striking P a paper tape copy of the block contents is obtained. If this paper tape is fed into the reader at some future date it will automatically reset the pointers and load the current block with its contents. This allows such operations as rescuing a valuable file when a Monitor failure has occurred or saving the old DN and SAM blocks while the monitor is rebuilt. The whole disk could be saved on paper tape in this way and later replaced. If the teletype is switched to LOCAL and a CONTROL-F IS PUNCHED INTO THE TAPE between each block of a file the tape will subsequently read in continuously once the first block has been located. A sample printout is shown in the APPENDIX.

LOCATION 5373 contains -376 which indicates to the program the number of blocks on the disk. If more than one disk unit is available this location should be changed as follows:

- 1 -376
- 2 -776
- 3 -1376
- 4 -1776

APPENDIX

SAMPLE LIST:

EX C	6101	0000
FOCN	6102	0034
PULS	6103	0040
LOAD	6104	0012
.CD.	6105	0015
BOSS	6106	0057
DYSK	6107	0061
FNUW	6110	0056
DUMP	0011	0101
PIP	6112	0125
DOD4	0013	0030
DODD	2014	0311
PALD	6115	0247
EDIT	6116	0307
DOD5	0017	0153
TIME	6120	0176
DOD1	0021	0110
DODD	0022	?
SINE	6123	0023
DOD2	0024	0120
DOD3	0025	0117
DODD	6126	0321
D0DD	2027	?
PNCH	6130	0332
FRIG	6131	0370

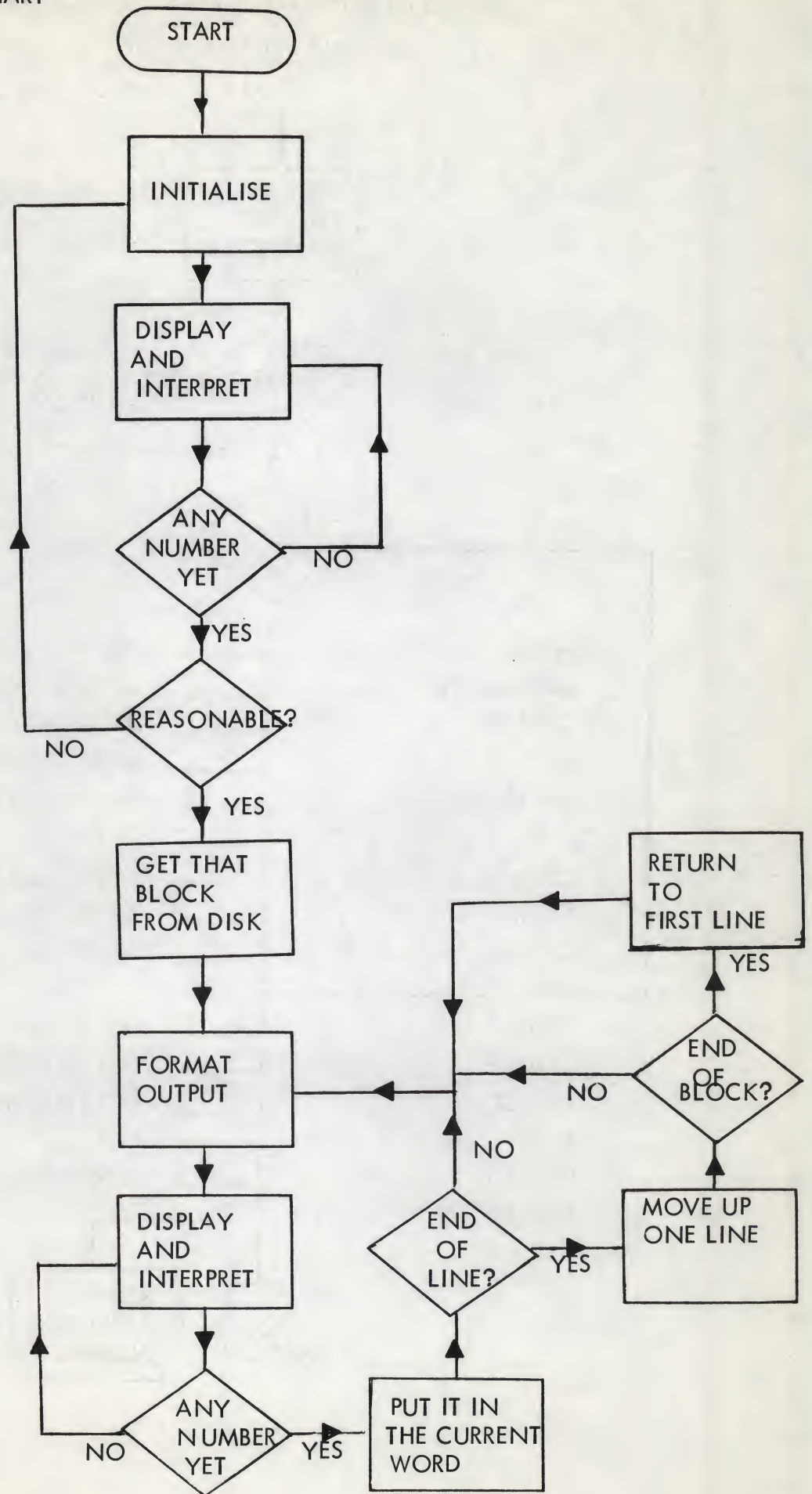
SAMPLE PRINT-OUT:

0373*3047*0200*4570*0043*7000*7000*6101
 4657*4356*7777*0200*6102*6065*5463*7777
 0400*6103*5457*4144*7000*7000*6104*1643
 4416*0000*0000*6105*4257*6363*0200*0400
 6106*4471*6353*7777*0200*6107*4656*6567
 7777*0200*6110*4465*5560*0000*0000*0011
 6051*6000*0000*1000*6112*4457*4424*0000
 0000*0013*4457*4444*0000*0000*2014*6041
 5444*0000*6200*6115*4544*5164*0000*2600
 6116*4457*4425*0000*0000*0017*6451*5545
 7777*0200*6120*4457*4421*0000*0000*0021
 4457*4444*0000*0000*0022*6351*5645*7777
 0000*6123*4457*4422*0000*0000*0024*4457
 4423*0000*0000*0025*4457*4444*4600*5200
 6126*4420*4444*0000*0000*2027*6056*4350
 2000*2000*6130*4662*5147*5400*0000*6131

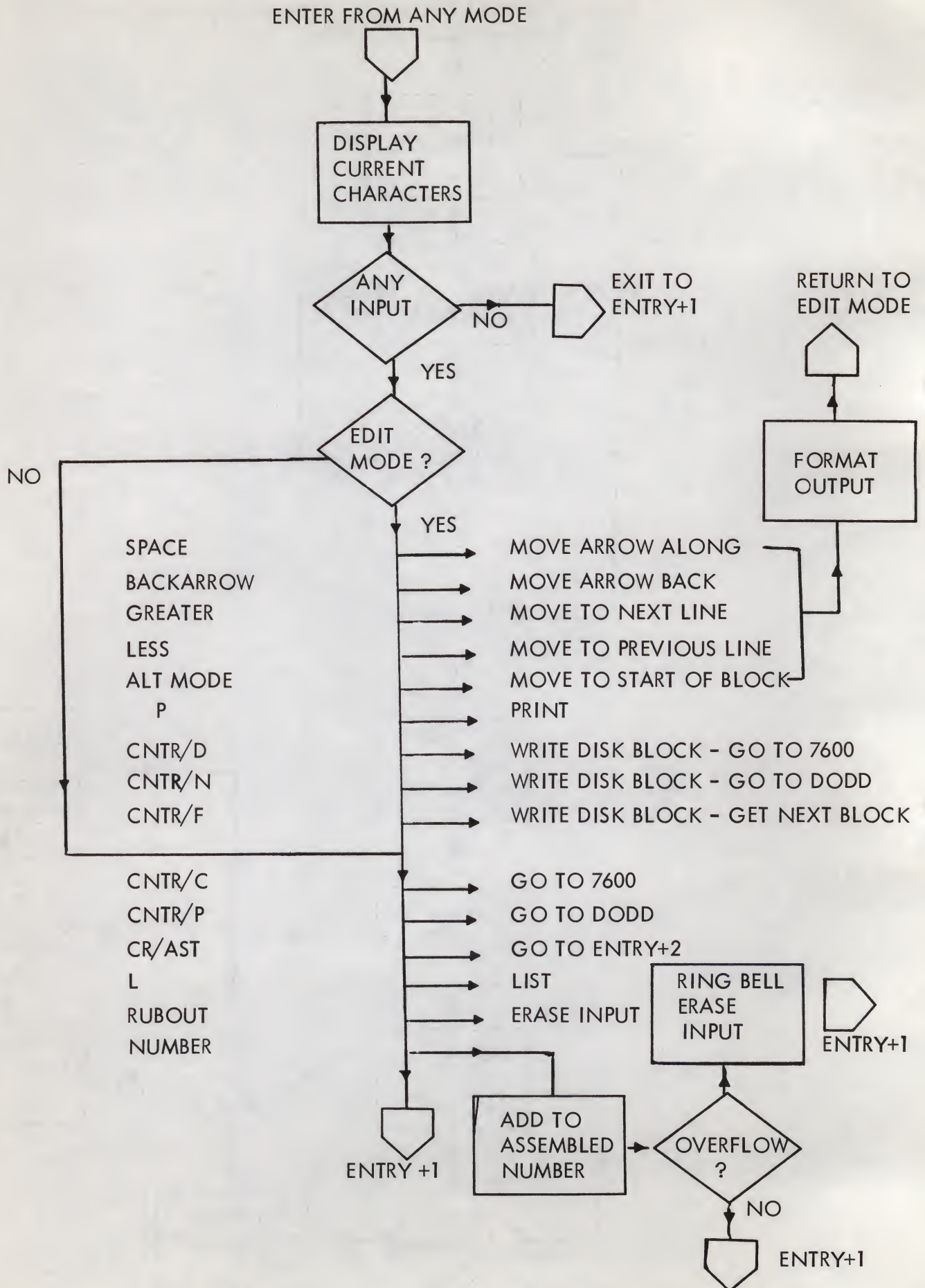
DODD - CORE ALLOCATION MAP

PDP-8/I CORE	7000
DISPLAY CHARACTERS	6600
DISPLAY FORMAT GENERATOR	6400
UTILITY SUBROUTINES	6200
CHARACTER GENERATOR	6000
CHARACTER GENERATOR	5600
DISK, INPUT/OUTPUT SUBROUTINE	5400
DODD BASIC PROGRAM	5200
INPUT INTERPRETER	5000
DIRECTORY LIST ROUTINE	4600
SAM BLOCK BUFFER	4400
DIRECTORY BUFFER	4200
DISK BLOCK BUFFER	4000

DODD MAIN FLOW CHART



DODD INTERPRETER-DISPLAY FLOW CHART



/DODD A. S. FRENCH 1969
 /THE DYNAMIC OCTAL DISK DEBUGGER
 /SEE WRITE-UP FOR FORMAT
 BUFFER=4000 /DISK BUFFER
 BUFE2=4200 /DIRECTORY
 BUFE3=4400 /SAM BLOCKS
 *4600

4600	1777	LIST,	TAD INPUT	/START OF DIRECTORY
4601	3341		DCA STORE7	/LISTING ROUTINE.
4602	4776		JMS CRLF	
4603	4775		JMS TRAILO	
4604	1374		TAD (177	
4605	3773		DCA DNLINK	
4606	4772	CYCLE6,	JMS DNGET	
4607	5741		JMP I STORE7	
4610	7325		CLA CLL CML IAC RAL	
4611	1771		TAD DNCORE	
4612	3330		DCA POINT4	
4613	1370		TAD (-31	
4614	3332		DCA KOUNT6	
4615	1730	CYCLE7,	TAD I POINT4	
4616	1367		TAD (-100	
4617	7450		SNA	
4620	5741		JMP I STORE7	
4621	1366		TAD (100	
4622	7450		SNA	
4623	5252		JMP EMPTY	
4624	4765		JMS NAME	
4625	2330		ISZ POINT4	
4626	1730		TAD I POINT4	
4627	4765		JMS NAME	
4630	1364		TAD (240	
4631	4763		JMS TYPEO	
4632	7325		CLA CLL CML IAC RAL	
4633	1330		TAD POINT4	
4634	3330		DCA POINT4	
4635	1730		TAD I POINT4	
4636	4762		JMS WORD	
4637	1364		TAD (240	
4640	4763		JMS TYPEO	
4641	1730		TAD I POINT4	
4642	0361		AND (77	
4643	4256		JMS SAMFND	
4644	4762		JMS WORD	
4645	4776		JMS CRLF	
4646	2330		ISZ POINT4	
4647	2332	CYCLE8,	ISZ KOUNT6	
4650	5215		JMP CYCLE7	
4651	5206		JMP CYCLE6	

4652	1360	EMPTY,	TAD (5	
4653	1330		TAD POINT4	
4654	3330		DCA POINT4	
4655	5247		JMP CYCLE8	
4656	0000	SAMFND,	0	/FIND STARTING SAM BLOCK
4657	3337		DCA STORE4	
4660	1357		TAD (200	
4661	3756		DCA SAMLNK	
4662	3336		DCA NUMBER	
4663	4755	CYCLEA,	JMS SAMGET	
4664	5324		JMP QUEER	
4665	7240		CLA CMA	
4666	3333		DCA KOUNT7	
4667	1361		TAD (77	
4670	3335		DCA MASK	
4671	1337		TAD STORE4	
4672	3340	CYCLE0,	DCA STORES	
4673	1354		TAD (-200	
4674	3334		DCA KOUNT8	
4675	1753		TAD SAMCOR	
4676	3331		DCA POINT5	
4677	1731	CYCLE9,	TAD I POINT5	
4700	0335		AND MASK	
4701	7041		CIA	
4702	1340		TAD STORE5	
4703	7650		SNA CLA	
4704	5322		JMP GOTIT	
4705	2336		ISZ NUMBER	
4706	2331		ISZ POINT5	
4707	2334		ISZ KOUNT8	
4710	5277		JMP CYCLE9	
4711	2333		ISZ KOUNT7	
4712	5263		JMP CYCLEA	
4713	1367		TAD (7700	
4714	3335		DCA MASK	
4715	1337		TAD STORE4	
4716	7106		CLL RTL	
4717	7006		RTL	
4720	7006		RTL	
4721	5272		JMP CYCLE0	
4722	1336	GOTIT,	TAD NUMBER	
4723	5656		JMP I SAMFND	
4724	1352	QUEER,	TAD (277	
4725	4763		JMS TYPEO	
4726	2256		ISZ SAMFND	
4727	5656		JMP I SAMFND	

4730	0000	POINT4,	Ø
4731	0000	POINT5,	Ø
4732	0000	KOUNT6,	Ø
4733	0000	KOUNT7,	Ø
4734	0000	KOUNT8,	Ø
4735	0000	MAST,	Ø
4736	0000	NUMBER,	Ø
4737	0000	STORE4,	Ø
4740	0000	STORE5,	Ø
4741	0000	STORE7,	Ø
4752	0277		
4753	6541		
4754	7600		
4755	6531		
4756	6542		
4757	0200		
4760	0005		
4761	0077		
4762	6244		
4763	5271		
4764	0240		
4765	6321		
4766	0100		
4767	7700		
4770	7747		
4771	5347		
4772	5337		
4773	5350		
4774	0177		
4775	5312		
4776	5304		
4777	5000		

5000	0000	INPUT,	PAGE	
5001	7200		Ø	/INPUT AND DISPLAY SUBROUTINE
5002	1777		CLA	
5003	4776		TAD DISPLA	
5004	6031		JMS I (5600	
5005	5600		KSF	
5006	1775		JMP I INPUT	
5007	7640		TAD INFLAG	
5010	5272		SZA CLA	
5011	6036		JMP EDIT	
5012	1374		KRB	
			TAD (-203	

5013	7450	RETURN,	SNA	
5014	5773		JMP I (7600)	/CONTROL-C
5015	1372		TAD (203-220)	
5016	7450		SNA	
5017	5771		JMP DODD	/CNTRL-P
5020	1370		TAD (220-215)	
5021	7450		SNA	
5022	5257		JMP TERM	/C. R.
5023	1367		TAD (215-252)	
5024	7450		SNA	
5025	5257		JMP TERM	/ASTER
5026	1366		TAD (252-377)	
5027	7450		SNA	
5030	5261		JMP ERASE	/RUBOUT
5031	1365		TAD (377-314)	
5032	7450		SNA	
5033	5764		JMP LIST	/L
5034	1363		TAD (314-375)	
5035	7450		SNA	
5036	5762		JMP ERROR1	/ALT MODE
5037	1361		TAD (375-260)	
5040	7510		SPA	
5041	5600		JMP I INPUT	
5042	1360		TAD (-10)	
5043	7500		SMA	
5044	5600		JMP I INPUT	
5045	1357		TAD (10)	
5046	3330		DCA TEMPO	/TEMP STORE
5047	1331		TAD BUFFX	
5050	7106		CLL RTL	
5051	7004		RAL	/BUFFER X 8
5052	7430		SZL	
5053	5264		JMP ERROR	/BUFFER OVERFLOW
5054	1330		TAD TEMPO	
5055	3331		DCA BUFFX	
5056	5600		JMP I INPUT	
5057	2200	TERM,	ISZ INPUT	/READ INPUT
5060	1331		TAD BUFFX	
5061	3330	ERASE,	DCA TEMPO	
5062	3331		DCA BUFFX	
5063	5600		JMP I INPUT	
5064	7300	ERROR,	CLA CLL	
5065	1356		TAD (207)	
5066	6046		TLS	
5067	6041		TSF	
5070	5267		JMP .-1	
5071	5261		JMP ERASE	

5072	6036	EDIT,	KRB	/EDIT BUFFER
5073	1355		TAD (-276	
5074	7450		SNA	
5075	5754		JMP UPPER	/>
5076	1353		TAD (276-274	
5077	7450		SNA	
5100	5752		JMP LOWER	/<
5101	1351		TAD (274-337	
5102	7450		SNA	
5103	5750		JMP BCKSPC	/BACK ARROW
5104	1347		TAD (337-320	
5105	7450		SNA	
5106	5746		JMP PUNCH	/P
5107	1345		TAD (320-240	
5110	7450		SNA	
5111	5744		JMP MOVE	/SPACE
5112	1343		TAD (240-375	
5113	7450		SNA	
5114	5742		JMP RESET	/ALT MODE
5115	1341		TAD (375-204	
5116	7450		SNA	
5117	5740		JMP DISCEN	/CNTRL-D
5140	5332			
5141	0171			
5142	5220			
5143	7643			
5144	5233			
5145	0060			
5146	6270			
5147	0017			
5150	6223			
5151	7735			
5152	6206			
5153	0002			
5154	6200			
5155	7502			
5156	0207			
5157	0010			
5160	7770			
5161	0115			
5162	6235			
5163	7717			
5164	4600			
5165	0063			
5166	7653			
5167	7743			
5170	0003			
5171	5200			
5172	7763			
5173	7600			

5174	7575			
5175	5356			
5176	5600			
5177	5354			
5120	1337		TAD (204-206	
5121	7450		SNA	
5122	5736		JMP FILEN	/CNTRL-F
5123	1335		TAD (206-216	
5124	7450		SNA	
5125	5734		JMP NEXTEN	/CNTRL-N
5126	1333		TAD (216-203	
5127	5213		JMP RETURN	/CHECK OTHERS
5130	0000	TEMPO,	0	/TEMP STORE
5131	0000	BUFFX,	0	/OCTAL INPUT BUFFER
5133	0013			
5134	5334			
5135	7770			
5136	5325			
5137	7776			
			PAGE	
5200	6032	DODD,	KCC	/START OF PROGRAM
5201	6042		TCF	
5202	6326		6326	/XR
5203	3777		DCA BUFFX	
5204	3356		DCA INFLAG	
5205	1776		TAD LIST1	/FIRST MESSAGE
5206	3354		DCA DISPLA	
5207	4775		JMS INPUT	
5210	5207		JMP .-1	/WAIT FOR ANSWER
5211	1774		TAD TEMPO	
5212	1373		TAD (-376	
5213	7700		SMA CLA	/REAL?
5214	5200		JMP DODD	
5215	1774		TAD TEMPO	
5216	3250	FILEX,	DCA BLOCK	
5217	4245		JMS DISCIN	
5220	3772	RESET,	DCA LINE	
5221	1251		TAD CORE	
5222	3336		DCA ARROW	
5223	4771		JMS FORMAT	
5224	2356		ISZ INFLAG	/ALLOW EDITING
5225	1770	READ,	TAD LIST2	
5226	3354		DCA DISPLA	/OUTPUT FIRST LINE
5227	4775		JMS INPUT	
5230	5227		JMP .-1	
5231	1774		TAD TEMPO	
5232	3736		DCA I ARROW	

5233	3777	MOVE,	DCA BUFFX	
5234	2336		ISZ ARROW	
5235	1772		TAD LINE	
5236	4771		JMS FORMAT	
5237	1336		TAD ARROW	
5240	0367		AND (7	
5241	7650		SNA CLA	
5242	5766		JMP UPPER	
5243	7300	ENTRAN,	CLA CLL	
5244	5225		JMP READ	/CYCLE
5245	0000	DISCIN,	0	/GET DISC BLOCK
5246	4765		JMS I (5400	
5247	0003		3	
5250	0000	BLOCK,	0	
5251	4000	CORE,	BUFFER	
5252	0000	LINK,	0	
5253	5764		JMP ERROR2	
5254	5645		JMP I DISCIN	
5255	0000	DISCOT,	0	/WRITE DISC BLOCK
5256	1252		TAD LINK	
5257	3266		DCA WLINK	
5260	1250		TAD BLOCK	
5261	3264		DCA WBLOCK	
5262	4765		JMS I (5400	
5263	0005		5	
5264	0000	WBLOCK,	0	
5265	4000	WCORE,	BUFFER	
5266	0000	WLINK,	0	
5267	5764		JMP ERROR2	
5270	5655		JMP I DISCOT	
5271	0000	TYPEO,	0	/TYPE OUT ROUTINE
5272	6046		TLS	
5273	7204		CLA RAL	
5274	3355		DCA LINX	
5275	4775		JMS INPUT	
5276	7000		NOP	
5277	6041		TSF	
5300	5275		JMP .-3	
5301	1355		TAD LINX	
5302	7010		RAR	
5303	5671		JMP I TYPEO	
5304	0000	CRLF,	0	/CRRiage RETURN
5305	1363		TAD (215	
5306	4271		JMS TYPEO	
5307	1362		TAD (212	
5310	4271		JMS TYPEO	
5311	5704		JMP I CRLF	

5312	0000	TRAILO,	Ø	/PAPER TAPE TRAILER
5313	1361		TAD (7600)	
5314	7133		CLL CML IAC RTR	
5315	3324		DCA KOUNT1	
5316	4271		JMS TYPEO	
5317	2324		ISZ KOUNT1	
5320	5316		JMP .-2	
5321	1360		TAD (375	
5322	4271		JMS TYPEO	
5323	5712		JMP I TRAILO	
5324	0000	KOUNT1,	Ø	
5325	4255	FILEN,	JMS DISCOT	/CONTROL-F
5326	1252		TAD LINK	
5327	7450		SNA	
5330	5200		JMP DODD	
5331	5216		JMP FILEX	
5332	4255	DISCEN,	JMS DISCOT	/CONTROL-D
5333	5761		JMP I (7600)	
5334	4255	NEXTEN,	JMS DISCOT	/CNTRL-N
5335	5200		JMP DODD	
5336	0000	ARROW,	Ø	
5337	0000	DNGET,	Ø	
5340	1350		TAD DNLINK	
5341	7450		SNA	
5342	5737		JMP I DNGET	
5343	3346		DCA DNBLOC	
5344	4765		JMS I (5400)	
5345	0003		3	
5346	0000	DNBLOC,	Ø	
5347	4200	DNCORE,	BUFFE2	
5350	0000	DNLINK,	Ø	
5351	5764		JMP ERROR2	
5352	2337		ISZ DNGET	
5353	5737		JMP I DNGET	
5354	0000	DISPLA,	Ø	
5355	0000	LINX,	Ø	
5356	0000	INFLAG,	Ø	
5360	0375			
5361	7600			
5362	0212			
5363	0215			
5364	6237			
5365	5400			
5366	6200			
5367	0007			
5370	6632			
5371	6400			
5372	6527			
5373	7402			
5374	5130			
5375	5000			
5376	6600			
5377	5131			

6200	2777	UPPER,	*6200	/SUBROUTINES FOR GENERAL SERVICE
6201	1777		ISZ LINE	/MOVES UP ONE LINE
6202	1376		TAD LINE	
6203	7710		TAD (-20)	
6204	1777		SPA CLA	
6205	5212		TAD LINE	
6206	7240	LOWER,	JMP LNCHNG	
6207	1777		CLA CMA	/MOVES DOWN ONE LINE
6210	7510		TAD LINE	
6211	5775		SPA	
6212	3777	LNCHNG,	JMP ENTRAN	
6213	1777		DCA LINE	
6214	7106		TAD LINE	
6215	7004		CLL RTL	
6216	1774	DIVER,	RAL	
6217	3773		TAD CORE	
6220	1777		DCA ARROW	
6221	4772		TAD LINE	
6222	5775		JMS FORMAT	
6223	1773	BCKSPC,	JMP ENTRAN	
6224	0371		TAD ARROW	/MOVES ARROW BACK
6225	7650		AND (7	
6226	5232		SNA CLA	
6227	7240		JMP NODICE	
6230	1773		CLA CMA	
6231	3773		TAD ARROW	
6232	1777	NODICE,	DCA ARROW	
6233	4772		TAD LINE	
6234	5775		JMS FORMAT	
6235	1770	ERROR1,	JMP ENTRAN	
6236	7410		TAD LIST3	/ERROR
6237	1767	ERROR2,	SKP	
6240	3766		TAD LIST4	
6241	4765		DCA DISPLA	
6242	7000		JMS INPUT	
6243	5241		NOP	
6244	0000	WORD,	JMP .-2	
6245	3266		0	/TYPES OUT A NUMBER
6246	1364		DCA STORE1	
6247	3267		TAD (-4	
6250	1266		DCA KOUNT2	
6251	7004		TAD STORE1	
6252	7004	CYCLE1,	RAL	
6253	7006		RAL	
6254	3266		RTL	
6255	1266		DCA STORE1	
6256	0371		TAD STORE1	
6257	1363		AND (7	
			TAD (260	

6260	4762		JMS TYPEO	
6261	1266		TAD STORE1	
6262	2267		ISZ KOUNT2	
6263	5252		JMP CYCLE1	
6264	7200		CLA	
6265	5644		JMP I WORD	
6266	0000	STORE 1,	Ø	
6267	0000	KOUNT2,	Ø	
6270	1774	PUNCH,	TAD CORE	/TYPES OUT A BLOCK
6271	3316		DCA POINT1	
6272	4761		JMS CRLF	
6273	4760		JMS TRAILO	
6274	1376		TAD (-20)	
6275	3317		DCA KOUNT3	
6276	1357	CYCLE3,	TAD (-10)	
6277	3320		DCA KOUNT4	
6300	1716	CYCLE2,	TAD I POINT1	
6301	2316		ISZ POINT1	
6302	4244		JMS WORD	
6303	2320		ISZ KOUNT4	
6304	7410		SKP	
6305	5311		JMP ENDLIN	
6306	1356		TAD (252	
6307	4762		JMS TYPEO	
6310	5300		JMP CYCLE2	
6311	4761	ENDLIN,	JMS CRLF	
6312	2317		ISZ KOUNT3	
6313	5276		JMP CYCLE3	
6314	4760		JMS TRAILO	
6315	5755		JMP READ	
6316	0000	POINT1,	Ø	
6317	0000	KOUNT3,	Ø	
6320	0000	KOUNT4,	Ø	
6321	0000	NAME,	Ø	/TYPES OUT A NAME
6322	3341		DCA STORE2	
6323	1341		TAD STORE2	
6324	7112		CLL RTR	
6325	7012		RTR	
6326	7012		RTR	
6327	0354		AND (77	
6330	1353		TAD (240)	
6331	0352		AND (377	
6332	4762		JMS TYPEO	
6333	1341		TAD STORE2	
6334	0354		AND (77	
6335	1353		TAD (240)	
6336	0352		AND (377	
6337	4762		JMS TYPEO	
6340	5721		JMP I NAME	

6341	0000	STORE2,	0
6352	0377		
6353	0240		
6354	0077		
6355	5225		
6356	0252		
6357	7770		
6360	5312		
6361	5304		
6362	5271		
6363	0260		
6364	7774		
6365	5000		
6366	5354		
6367	6623		
6370	6613		
6371	0007		
6372	6400		
6373	5336		
6374	5251		
6375	5243		
6376	7760		
6377	6527		

6400	0000	FORMAT,	PAGE	/OUTPUT FORMAT
6401	7106		0	
6402	7004		CLL RTL	
6403	1777		RAL	
6404	3323		TAD CORE	
6405	1776		DCA POINT2	
6406	3324		TAD LIST2	
6407	1375		DCA POINT3	
6410	3325		TAD (-10)	
6411	1327		DCA KOUNT5	
6412	0374		TAD LINE	
6413	7104		AND (70)	
6414	7006		CLL RAL	
6415	1327		RTL	
6416	0373		TAD LINE	
6417	1372		AND (707)	
6420	3724		TAD (6060)	
6421	2324		DCA I POINT3	
6422	1371		ISZ POINT3	
6423	3724		TAD (7373)	
6424	2324		DCA I POINT3	
6425	1723	CYCLE5,	ISZ POINT3	
6426	2323		TAD I POINT2	
6427	3326		ISZ POINT2	
6430	7240		DCA STORE3	
6431	3330		CLA CMA	
			DCA SWITCH	

6432	1326	CYCLE4,	TAD STORE3
6433	0370		AND (7000)
6434	7112		CLL RTR
6435	7010		RAR
6436	1367		TAD (6000)
6437	3724		DCA I POINT3
6440	1326		TAD STORE3
6441	0366		AND (700)
6442	7112		CLL RTR
6443	7012		RTR
6444	7012		RTR
6445	1365		TAD (60)
6446	1724		TAD I POINT3
6447	3724		DCA I POINT3
6450	2324		ISZ POINT3
6451	1326		TAD STORE3
6452	7106		CLL RTL
6453	7006		RTL
6454	7006		RTL
6455	3326		DCA STORE3
6456	2330		ISZ SWITCH
6457	7410		SKP
6460	5232		JMP CYCLE4
6461	1364		TAD (4040)
6462	3724		DCA I POINT3
6463	2324		ISZ POINT3
6464	2325		ISZ KOUNT5
6465	5225		JMP CYCLE5
6466	1363		TAD (4073)
6467	3724		DCA I POINT3
6470	2324		ISZ POINT3
6471	1762		TAD ARROW
6472	7001		IAC
6473	7041		CIA
6474	3325		DCA STORE3
6475	1327		TAD LINE
6476	7106		CLL RTL
6477	7004		RAL
6500	1777		TAD CORE
6501	1326		TAD STORE3
6502	3326		DCA STORE3
6503	1361		TAD (-3
6504	2326		ISZ STORE3
6505	5303		JMP .-2
6506	1360		TAD (2
6507	3326		DCA STORE3
6510	1364		TAD (4040)

6511	3724		DCA I POINT3
6512	2324		ISZ POINT3
6513	2326		ISZ STORE3
6514	5310		JMP .-4
6515	1357		TAD (3640)
6516	3724		DCA I POINT3
6517	2324		ISZ POINT3
6520	1356		TAD (3700)
6521	3724		DCA I POINT3
6522	5600		JMP I FORMAT
6523	0000	POINT2,	0
6524	0000	POINT3,	0
6525	0000	KOUNT5,	0
6526	0000	STORE3,	0
6527	0000	LINE,	0
6530	0000	SWITCH,	0
6531	0000	SAMGET,	0
6532	1342		TAD SAMLNK
6533	7450		SNA
6534	5731		JMP I SAMGET
6535	3340		DCA SAMBLK
6536	4755		JMS I (5400)
6537	0003		3
6540	0000	SAMBLK,	0
6541	4400	SAMCOR,	BUF3
6542	0000	SAMLNK,	0
6543	5754		JMP ERROR2
6544	2331		ISZ SAMGET
6545	5731		JMP I SAMGET
6554	6237		
6555	5400		
6556	3700		
6557	3640		
6560	0002		
6561	7775		
6562	5336		
6563	4073		
6564	4040		
6565	0060		
6566	0700		
6567	6000		
6570	7000		
6571	7373		
6572	6060		
6573	0707		
6574	0070		
6575	7770		
6576	6632		
6577	5251		

		PAGE	/CHARACTER LISTS
6600	6601 LIST1,	.+1	
6601	2431	2431	
6602	2005	2005	
6603	4002	4002	
6604	1417	1417	
6605	0313	0313	
6606	4016	4016	
6607	2515	2515	
6610	0205	0205	
6611	2240	2240	
6612	3700	3700	
6613	6614 LIST3,	.+1	
6614	1116	1116	
6615	2025	2025	
6616	2440	2440	
6617	0601	0601	
6620	2514	2514	
6621	2477	2477	
6622	3700	3700	
6623	6624 LIST4,	.+1	
6624	0411	0411	
6625	2313	2313	
6626	4005	4005	
6627	2222	2222	
6630	1722	1722	
6631	3700	3700	
6632	6633 LIST2,	.+1	

NOT INCLUDED IN THIS LISTING ARE:

DISC INPUT/OUTPUT SUBROUTINE (SIMILAR TO DEC MONITOR SYSTEM SYS10)
 24 DOT MATRIX CHARACTER GENERATOR (AS SUPPLIED BY CANADA SOFTWARE SUPPORT)

ARROW	5336
BCKSPC	6223
BLOCK	5250
BUFFER	4000
BUFFE2	4200
BUFFE3	4400
BUFFX	5131
CORE	5251
CRLF	5304
CYCLEA	4663
CYCLE0	4672
CYCLE1	6252
CYCLE2	6300
CYCLE3	6276
CYCLE4	6432
CYCLE5	6425
CYCLE6	4606
CYCLE7	4615
CYCLE8	4647
CYCLE9	4677
DISCEN	5332
DISCIN	5245
DISCOT	5255
DISPLA	5354
DIVER	6216
DNBLOC	5346
DNCORE	5347
DNGET	5337
DNLINK	5350
DODD	5200
EDIT	5072
EMPTY	4652
ENDLIN	6311
ENTRAN	5243
ERASE	5061
ERROR	5064
ERROR1	6235
ERROR2	6237
FILEN	5325
FILEX	5216
FORMAT	6400
GOTIT	4722
INFLAG	5356
INPUT	5000
KOUNT1	5324
KOUNT2	6267
KOUNT3	6317
KOUNT4	6320
KOUNT5	6525
KOUNT6	4732
KOUNT7	4733
KOUNT8	4734

LINE	6527
LINK	5252
LINX	5355
LIST	4600
LIST1	6600
LIST2	6632
LIST3	6613
LIST4	6623
LNCHNG	6212
LOWER	6206
MASK	4735
MOVE	5233
NAME	6321
NEXTEN	5334
NODICE	6232
NUMBER	4736
POINT1	6316
POINT2	6523
POINT3	6524
POINT4	4730
POINT5	4731
PUNCH	6270
QUEER	4724
READ	5225
RESET	5220
RETURN	5013
SAMBLK	6540
SAMCOR	6541
SAMFND	4656
SAMGET	6531
SAMLNK	6542
STORE1	6266
STORE2	6341
STORE3	6526
STORE4	4737
STORE5	4740
STORE7	4741
SWITCH	6530
TEMPO	5130
TERM	5057
TRAILO	5312
TYPEO	5271
UPPER	6200
WBLOCK	5264
WCORE	5265
WLINK	5266
WORD	6244